July 8, 1969 R. C. WOLF 3,454,050

ACCUMULATORS

Filed Jan. 31, 1967

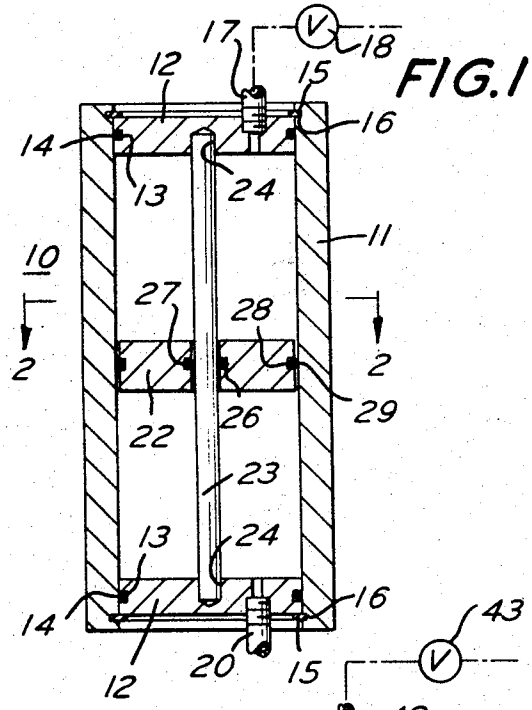


FIG. 1

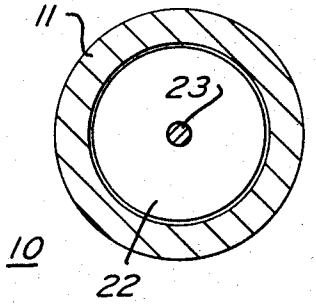


FIG. 2

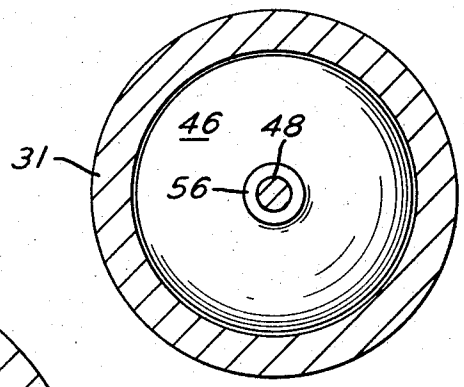


FIG. 4

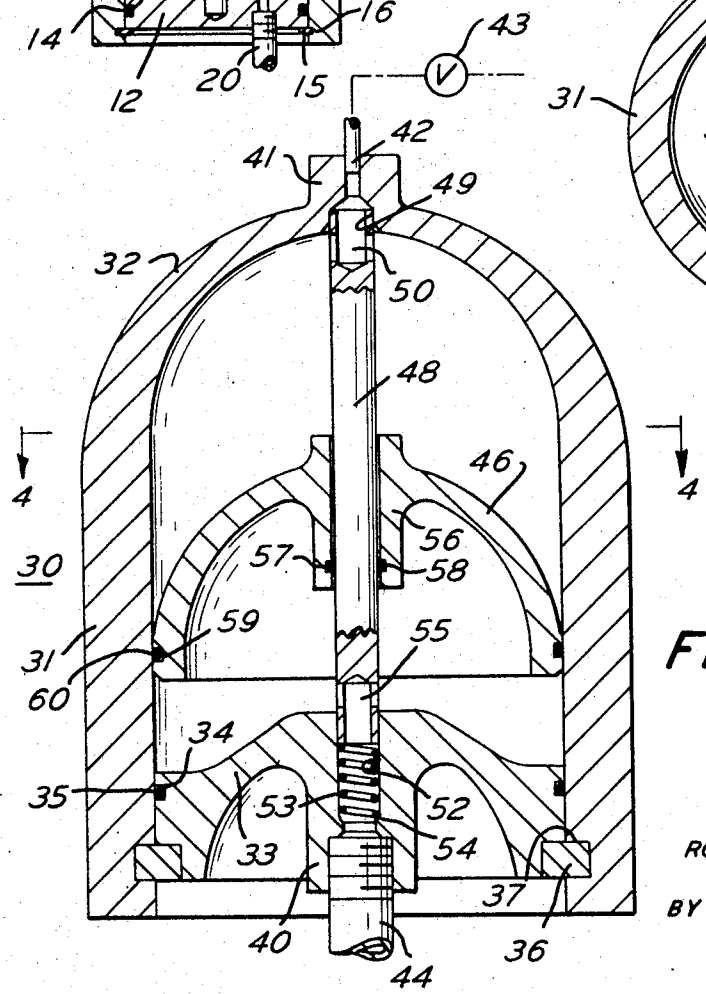


FIG. 3

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U.S. Cl. 138—31 7 Claims

ABSTRACT OF THE DISCLOSURE

An accumulator for high pressure operation in which the floating piston has an auxiliary guide whereby it and its cylinder can be of reduced dimensions and of lighter weight.

Background of the invention

Field of the invention.—This invention relates to accumulators of the type which include a cylinder with a free piston therein, one end of the cylinder being precharged under pressure, and the other end providing a resilient receiver.

Description of the prior art.—It has heretofore been proposed to provide an accumulator having a hollow circular cylindrical wall with closures at opposite ends and with a free piston interposed between the ends. Such a piston customarily has a length approximately equal to the internal diameter of the cylinder to provide support for its longitudinal axial movement. This length is provided to prevent tilting which tends to occur when the piston is subjected to pressure. The length required for the piston, influences the length of the cylinder. Even if the piston is made hollow to reduce its weight, the weight of the cylinder, determined by its length, cannot be reduced. There are accordingly serious practical limitations on the reductions in size and weight which can be effected.

Summary of the invention

It is the principal object of the present invention to provide an accumulator for pressure fluid which is simple in construction, can be made smaller and lighter in weight than accumulators heretofore available, and which will have a wide range of usefulness.

It is af urther object of the present invention to provide an accumulator for pressure fluid which can be constructed for high pressure operation while having adequate strength and freedom from likelihood of operating difficulties.

Other objects and advantageous features of the invention will be apparent from the description and claims.

Brief description of the drawing

The nature and characteristic features of the invention will be more readily understood from the following description taken in connection with the accompanying drawings forming part thereof, in which:

FIGURE 1 is a longitudinal central sectional view of one form of accumulator in accordance with the invention;

FIG. 2 is a transverse sectional view taken approximately on the line 2—2 of FIG. 1;

FIG. 3 is a longitudinal central sectional view of another form of accumulator in accordance with the invention; and

FIG. 4 is a transverse sectional view taken approximately on the line 3—3 of FIG. 4.

It should, of course, be understood that the description and drawings herein are illustrated merely, and that various modifications and changes can be made in the structure disclosed without departing from the spirit of the invention.

Like numerals refer to like parts throughout the several views.

Description of the preferred embodiments

Referring now more particularly to FIGS. 1 and 2 of the drawings, in which one preferred embodiment of the invention is illustrated, the accumulator there shown includes a cylinder **10** having a hollow circular cylindrical wall **11** of suitable thickness to accommodate the desired internal pressures.

The cylinder **10** has heads or end closures **12** which may have peripheral grooves **13** for the reception of suitable packings **14**, such as O-rings. The end closures **12** can be retained against outward movement by peripherally split retainer rings **15** which engage in grooves **16** in the wall **11**.

One of the end closures **12** can be provided with a fluid connection **17**, connected through a shut off valve **18** to a source (not shown) of charging gaseous fluid under pressure. The other end closure **12** can then be provided with a fluid connection **20** for the fluid to be delivered to and from the accumulator.

In many of the accumulators heretofore available, the piston interposed between the end closures **12** would have had a longitudinal axial dimension coresponding to the internal diameter of the cylinder wall **11**.

In accordance with the present invention auxiliary support is provided for the piston **22** and the piston **22** which is employed as a movable separator in the cylinder **10** is carried on a supporting rod **23**. The rod **23** is mounted at its ends in openings **24** in the end closures **12**. The rod **23** can have a diameter of the order of one eighth of the internal diameter of the cylinder wall **11** and preferably has a polished surface.

The piston **23** is slidably mounted on the rod **23** and can have a groove **26** within which a packing **27**, such as an O-ring, is carried, to prevent fluid leakage at this location.

The periphery of the piston **23** has a groove **28** within which a packing **29**, such as an O-ring, is carried, to prevent fluid leakage at this location. By employing the rod **23** as an auxiliary support for the piston **22**, the piston **22** can be of a greatly reduced length or thickness while still being free from tilting within the cylinder **10** upon the application of pressure thereon. The reduction of thickness of the piston **22** permits of shortening the cylinder **10** while retaining the same effective internal volume as with a longer piston.

Referring now more particularly to FIGS. 3 and 4 of the drawings, in which another preferred embodiment of the invention is illustrated, a cylinder **30** is provided having a hollow circular cylindrical wall **31** and a hemispherical end closure wall **32** of suitable thickness to accomodate the desired internal pressures. The use of the hemispherical shape of the end closure wall **32** permits of lesser thickness than that required for the wall **31**.

The cylindrical wall **31** has an end closure **33** which may have a peripheral groove **34** for the reception of a suitable packing **35**, such as an O-ring, to prevent fluid leakage at this location.

The end closure **33** can be retained against outward movement by a peripherally split ring **36** which engages in a groove **37** in the wall **31**.

The end closure **33** can be of any desired shape but is preferably dished inwardly with an internal boss **40**.

The end wall **32** preferably has an outwardly extending boss **41** for a fluid connection **42** which is connected through a shut off valve **43** to a source (not shown) of charging pressure.

The end closure **33** has a fluid connection **44** for the fluid to be delivered to and from the accumulator.

A piston **46** is provided within the cylinder **30** and is slidably carried on a fixed supporting rod **48**. The rod **48**

is mounted at one end in an opening **49** in the wall **32** and preferably has an interior passageway **50** to provide communication between the fluid connection **42** and the interior of the cylinder **30**.

The rod **48** at its opposite end is mounted in an opening **52** in the end closure **33**. A spring **53** engaged against a shoulder **54** and bearing on the end of the rod **48** may be employed to retain the rod in position.

The rod **48** is provided with an interior pasageway **55** to provide communication between the fluid connection **44** and the interior of the cylinder **30**.

The piston **46** can be of any desired shape but is preferably inwardly dished with a central boss **56** slidable on the rod **48** and with a groove **57** for the reception of a packing **58**, such as an O-ring, to prevent fluid leakage. The periphery of the piston **46** is also preferably provided with a groove **59** for the reception of a packing **60**, such as an O-ring.

The accumulator of the present invention is suitable in a specific embodiment for minimum bursting pressures of the order of 40,000 p.s.i., with a working pressure of the order of 10,000 p.s.i. and with a precharge or loading pressure introduced through the fluid connection **17** or **42** into the interior of the cylinder **10** or **30**.

Dry nitrogen is advantageously used as the charging fluid for a particular use. A wide range of operating temperatures can be employed say from −65° F. to 180° F.

As pressure fluid is applied in use, through the fluid connection **20** or the fluid connection **42** the piston **22** or **46** will be moved to a position to maintain equal pressures on opposite sides thereof. The cycling action may be rapid dependent upon the specific conditions encountered in use.

I claim:

1. An accumulator comprising:

a cylinder having closed ends,

a piston in said cylinder movable intermediate said ends,

a support for said piston comprising a rod engaged with at least one of said ends and on which said piston is slidably mounted,

a charging fluid connection at one of said ends, and

a working fluid connection at the other of said ends,

said ends having openings for the reception of opposite ends of said rod, and

said rod having a resilient member disposed in one of said openings in engagement therewith and urging it into engagement in the other of said openings.

2. An accumulator as defined in claim **1** in which:

the thickness of said piston along the longitudinal axis of the cylinder is less than the diameter of the cylinder

3. An accumulator as defined in claim **1** in which:

said rod has fluid passageways communicating with opposite interior portions of said cylinder and with which said fluid connections are in communication.

4. An accumulator as defined in claim **1** in which:

said cylinder has a cylindrical wall portion,

said cylinder ends are of dished shape,

said piston is of dished shape,

said support is carried at its ends in said cylinder ends, and

said rod has fluid passageways communicating with interior portions of said cylinder at opposite ends of said cylinder and with which said fluid connections are in communication.

5. An accumulator as defined in claim **1** in which:

said cylinder has a cylindrical wall portion, and

at least one of said cylinder ends is of dished shape and is integral with the cylindrical wall portion.

6. An accumulator as defined in claim **5** in which:

the other of said cylinder ends is removably mounted in the cylindrical wall and is of dished shape.

7. An accumulator as defined in claim **5** in which:

said piston is of dished shape.

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